Innovative Management Strategies for an Efficient Water Supply and Use

Ricardo Rato
Contents

• About ISQ;

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ABOUT ISQ
ABOUT ISQ

Founded in 1965

headquarters in Portugal

Mission:
Provide Scientific and Technological Support to Industry

WORLD OF SOLUTIONS

www.isq-group.com
SUSTAINABLE INNOVATION CENTRE

CREATING VALUE

APPLIED RESEARCH

TECHNICAL EXCELLENCE

INDUSTRY PARTNER

- Life Cycle Assessment
- Eco-efficiency
- Circular Economy
- Industrial symbiosis

- Optimization strategies
- Waste heat recovery
- ESCO - Innovative business models
- Modeling of energy systems

- Nano-safety
- Climate Change Adaptation
- Industrial Safety
- Hazardous substances
SMART WATER SUPPLY SYSTEMS
Motivation

- Large scale and complex systems
- Energy intensity consumers
- Aging infrastructure
- Water leakages
- Inefficient control strategies
- Lack of information for decision support
Challenge

How to operate this systems in a more resilient and efficient way?
LIFE Smart Water Supply System

Start of project: September 2015

End of project: August 2018

Budget: 1.4 Million Euros

Funding Program: LIFE financial instrument of the EU

Coordinator: ISQ

Partnership:
LIFE Smart Water Supply System

Main objectives

1. Create an innovative management and decision support platform (SWSS)
2. Demonstrate SWSS platform on three demonstration systems
3. Decrease the energy consumption, GHG emissions and water leakage
LIFE Smart Water Supply System

SWSS Platform

**Inputs**
- SCADA and GIS
- General system characteristics
- Operational conditions: Survey

**Outputs**
- Alerts
- Demand forecasting
- Scenario evaluation
- Scheduling of pumps
- Performance indicators
- Reports

**Modules**
- Predictive module
- Assessment module
- Hydraulic Simulation Model
- Leakage Detection Module
- Optimization Module

**Outputs**
- Off-line component Planning & Decision Support
- On-line component Operational Management

**Inputs**
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- General system characteristics
- Operational conditions: Survey

**Outputs**
- Alerts
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LIFE Smart Water Supply System

Demonstration systems

• 24 pumping stations;

• Water Supply;
  • 40 Mm$^3$/year.

• Energy use;
  • 17 GWh/year.
  • 1.6 Million euros.
LIFE Smart Water Supply System

Approach

1. Survey of the systems
**Approach**

1. Survey of the systems

<table>
<thead>
<tr>
<th>Nº of pumps working</th>
<th>0</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow rate [m³/h]</td>
<td>0,0</td>
<td>260</td>
<td>479</td>
</tr>
<tr>
<td>Head [m]</td>
<td>15,9</td>
<td>18,0</td>
<td>21,9</td>
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<tr>
<td>Increase of Head [%]</td>
<td>-</td>
<td>0,0%</td>
<td>21,4%</td>
</tr>
</tbody>
</table>
Approach

2. Mathematical modelling
2. Mathematical modelling – Hydraulic Simulation (EPANET)
Approach

2. Mathematical modelling - Forecasting Models
LIFE Smart Water Supply System

Approach

2. Mathematical modelling – Optimization

- Demand forecasting
- Energy Tariffs
- Storage capacity
- System characteristics & Constrains
- Hydraulic model
- Level of risk

Optimal strategy to operate the system for the next 24 hours
LIFE Smart Water Supply System

Conclusions

• The first aspect to improve is to know what is the current status;
• Integrated view of the water supply system is needed;
• Innovative modelling tools allow to increase level of understanding and identify technological and management opportunities
EFFICIENT INDUSTRIAL WATER CIRCUITS
Motivation

Industrial water circuits are often a neglected part of production systems

Energy and water intensity consumers

High improvement potential

No benchmarks available

Lack of awareness
Challenge

How to raise awareness regarding efficient management of industrial water circuits?
WaterWatt

**Name**: Improvement of energy efficiency in industrial water circuits using gamification for online self-assessment, benchmarking and economic decision support

**Start of project**: April 2016  
**End of project**: March 2019

**Budget**: 1,8 Million Euros

**Funding Program**: European Union’s Horizon 2020 research and innovation programme

**Partnership**: [Partnership Logos]
WaterWatt

Main objectives

1. Contribute to a better understanding of energy consumption in Industrial Water Circuits
2. Evaluate and promote best practices
3. Study Human and Organizational challenges regarding Energy & Water management in industries
It will focus attention on the importance of energy saving in water circuits, supporting the engagement of people using gamification approach.

It will host a shared know-how (best practices, technologies and organizational models) concerning the energy and water management.

It will provide tools for self-assessment and monitoring, providing information and a cohering vision of a common goal.

It will enable situated initiatives such as field trials, training and exercises.
Case studies

• 10 water circuits will be studied and modeled;
• Industrial sectors covered: Steel, Non-Ferrous Metals, Chemical, Pulp and Paper, Food.

Expected impact

• reduction of energy consumption of at least 10%.
Approach

1. Study energy consumption in IWC
2. Modelling and optimization of IWC
3. E³ platform and training activities

Case Studies

Open to community
Acknowledgements

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THANK YOU

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